

**CLAIMS**

What is claimed is:

1. An aqueous dispersion comprising
  - 5 A. a partially fluorinated urethane polymer having at least one urea linkage, which compound is the product of the reaction of: (1) at least one organic polyisocyanate containing at least three isocyanate groups; (2) at least one fluorochemical compound which contains per molecule (a) a single functional group having one or more Zerewitinoff hydrogen atoms and (b) at least two carbon atoms, each of which is attached to at least two fluorine atoms; and (3) water in an amount sufficient to react with from about 5% to about 60% of the isocyanate groups in said polyisocyanate;
  - 10 B. a non-fluorinated cationic surfactant; and
  - 15 C. a non-fluorinated nonionic surfactant.
2. The dispersion of Claim 1 wherein the cationic surfactant is selected from the group consisting of salts of protonated amines, quaternary ammonium salts, and amine oxides.
3. The dispersion of Claim 2 wherein the cationic surfactant is selected from the group consisting of at least one of a protonated alkyl dimethyl amine salt, protonated dialkyl methyl amine salt, protonated alkyl ethoxylated amine salt, protonated alkyl diamine salt, protonated alkyl ethoxylated diamine salt, alkyl trimethyl ammonium salt, dialkyl dimethyl ammonium salt, alkyl methyl ethoxylated ammonium salt,
- 20 alkyl dimethyl benzyl ammonium salt, dialkyl methyl benzyl ammonium salt, alkyl pyridinium salt, alkylamidomethyl pyridinium salt, carboalkoxy pyridinium salt, alkyl quolinium salt, alkyl isoquinolinium salt, N,N-alkyl methyl pyrrolidinium salt, amidomidazolium salt, amido ammonium salt, quaternary ammonium salt of alkyl diamine, ethoxylate of a quaternary ammonium salt of alkyl diamine, alkyl dimethyl amine oxide, dialkyl methyl amine oxide, and alkyl diamine oxide.
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4. The dispersion of Claim 3 wherein the cationic surfactant is dialkyl dimethyl ammonium chloride.

5. The dispersion of Claim 1 wherein the nonionic surfactant is a condensate with ethylene oxide of at least one of a fatty

5 acid alkanol amide, an alkyl phenol, a fatty acid, a fatty alcohol, an ester of a fatty acid and polyhydric alcohol, and a polyoxypropylene block copolymer.

6. The dispersion of Claim 5 wherein the nonionic surfactant is of the formula A

10



wherein x is 12 to 18 and n is 5 to 100.

7. The dispersion of Claim 6 wherein the nonionic surfactant is a polyethoxylated linear alcohol.

8. The dispersion of Claim 1 wherein the cationic surfactant is selected from the group consisting of salts of protonated amines, quaternary ammonium salts, and amine oxides, and the nonionic surfactant is a condensate with ethylene oxide of at least one of a fatty acid alkanol amide, an alkyl phenol, a fatty acid, a fatty alcohol, an ester of a fatty acid and polyhydric alcohol, and a polyoxypropylene block copolymer.

9. The dispersion of Claim 8 wherein the cationic surfactant is dialkyl dimethyl ammonium chloride and the non-ionic surfactant is a polyethoxylated linear alcohol.

25 10. The dispersion of Claim 1 wherein the amount of surfactant is from about 1.5% to about 8% by weight based on the amount of the partially fluorinated urethane polymer.

11. The dispersion of Claim 1 wherein the amount of 30 water is sufficient to react with about 15% to about 30% of said isocyanate groups.

12. The dispersion of Claim 1 wherein the polyisocyanate is selected from the group consisting of hexamethylene diisocyanate homopolymer, hydrocarbon diisocyanate-derived trimer, isocyanate trimer of toluene diisocyanate, and isocyanate trimer of 3-isocyanato-methyl-

5 3,4,4-trimethylcyclohexyl isocyanate.

13. The dispersion of Claim 1 wherein said fluorochemical compound which contains a single functional group is represented by the formula:



10 in which

$R^f$  is a monovalent aliphatic group containing at least two carbon atoms each of which is attached to at least two fluorine atoms;

$R$  is a divalent organic radical;

15  $k$  is 0 or 1; and

$X$  is  $-O-$ ,  $-S-$ , or  $-N(R^3)-$  in which  $R^3$  is H, alkyl containing 1 to 6 carbon atoms or a  $R^f-R_k-$  group.

14. The dispersion of Claim 1 wherein said fluorochemical compound which contains a single functional group is represented by the formula:



in which

$R^f$  is a mixture of perfluoroalkyl groups,  $CF_3CF_2(CF_2)_r$ , in which  $r$  is 2 to 18; and

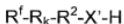
25  $q$  is 1, 2 or 3.

15. The dispersion of Claim 14 wherein

$R^f$  is a mixture of said perfluoroalkyl groups,  $CF_3CF_2(CF_2)_r$ ; and  $r$  is 2, 4, 6, 8, 10, 12, 14, 16, and 18.

16. The dispersion of Claim 14 wherein  $X$  is oxygen and  $q$  30 is 2.

17. The dispersion of Claim 1 wherein said fluorochemical compound which contains a single functional group is represented by the formula:



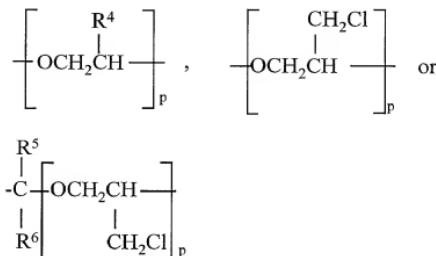
wherein

R<sup>f</sup> is a monovalent aliphatic group containing at least two carbon atoms each of which is attached to at least two fluorine atoms;

5 R is the divalent radical: -C<sub>m</sub>H<sub>2m</sub>SO-, -C<sub>m</sub>H<sub>2m</sub>SO<sub>2</sub>-,  
-SO<sub>2</sub>N(R<sup>3</sup>)-, or -CON(R<sup>3</sup>)- in which m is 1 to 22 and R<sup>3</sup> is H or alkyl of 1 to 6 carbon atoms;

k is 0 or 1;

10 R<sup>2</sup> is the divalent linear hydrocarbon radical: -C<sub>n</sub>H<sub>2n</sub>-  
which can be optionally end-capped by



15 n is 0 to 12, p is 1 to 50, and R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are the same or different H or alkyl containing 1 to 6 carbon atoms; and

X' is -O-, -S-, or -N(R<sup>7</sup>)- in which R<sup>7</sup> is H, alkyl containing 1 to 6 carbon atoms or a R<sup>f</sup>-R<sub>k</sub>-R<sup>2</sup>- group.

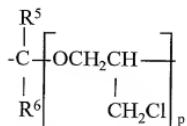
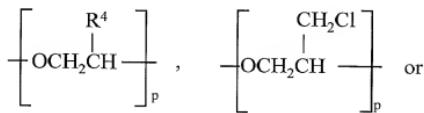
18. The dispersion of Claim 1 additionally comprising a  
20 non-fluorinated organic compound represented by the formula:



wherein

R<sup>10</sup> is a C<sub>1</sub>-C<sub>18</sub> alkyl, a C<sub>1</sub>-C<sub>18</sub> omega-alkenyl radical or a C<sub>1</sub>-C<sub>18</sub> omega-alkenoyl;

R<sup>11</sup> is



R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are the same or different H or alkyl

5 radical containing 1 to 6 carbon atoms and p is  
1 to 50;

k is 0 or 1; and

Y is -O-, -S-, or -N(R<sup>3</sup>)- in which R<sup>3</sup> is H or alkyl  
containing 1 to 6 carbon atoms.

10 19. A method for providing water and oil repellency to a substrate comprising application to the substrate of an aqueous dispersion comprising

A. a partially fluorinated urethane polymer having at least one urea linkage, which compound is the product of the reaction of: (1) at least

15 one organic polyisocyanate containing at least three isocyanate groups; (2) at least one fluorochemical compound which contains per molecule (a) a single functional group having one or more Zerewitinoff hydrogen atoms and (b) at least two carbon atoms, each of which is attached to at least two fluorine atoms; and (3) water in an amount sufficient to react with from about 5% to about 60% of the isocyanate groups in said polyisocyanate;

20 B. a non-fluorinated cationic surfactant; and

C. a non-fluorinated nonionic surfactant.

20. The method of Claim 19 wherein the dispersion contains a cationic surfactant selected from the group consisting of salts of protonated amines, quaternary ammonium salts, and amine oxides, and the nonionic surfactant is a condensate with polyethylene oxide of at least 5 one of a fatty acid alkanol amide, an alkyl phenol, a fatty acid, a fatty alcohol, an ester of a fatty acid and polyhydric alcohol, and a polyoxypropylene block copolymer.

21. The method of Claim 20 wherein the dispersion contains a cationic surfactant which is dialkyl dimethyl ammonium chloride 10 and the non-ionic surfactant is a polyethoxylated linear alcohol.

22. The method of Claim 19 wherein the dispersion is applied at a rate sufficient to provide from about 100 micrograms to about 2000 micrograms fluorine per gram of dry substrate fiber.

23. The method of claim 19 wherein the dispersion is 15 applied by spraying or foaming.

24. The method of claim 19 wherein the dispersion is co-applied with a composition which provides stain resistance.

25. A substrate treated with an aqueous dispersion comprising

20 A. a partially fluorinated urethane polymer having at least one urea linkage, which compound is the product of the reaction of: (1) at least one organic polyisocyanate containing at least three isocyanate groups; (2) at least one fluorochemical compound which contains per molecule (a) a single functional group having one or more Zerewitinoff hydrogen atoms and (b) at least two carbon atoms, each of which is attached to at least two fluorine atoms; and (3) water in an amount sufficient to react with from about 5% to about 60% of the isocyanate groups in said polyisocyanate;

B. a non-fluorinated cationic surfactant; and

25 C. a non-fluorinated nonionic surfactant.

30 26. The substrate of Claim 25 which is a carpet.

27. The substrate of Claim 25 having a coating on the surface thereof comprising a dispersion of Claim 1 and at least one stainblocker.

28. The substrate of Claim 25 having a coating on the surface thereof containing from about 100 micrograms to about 2000 micrograms fluorine per gram of dry substrate fiber.

29. The substrate of Claim 26 which is nylon, polyester, polyolefin, wool, polytrimethylene terephthalate, cotton, jute or sisal.